

Effects of coir fibres modified with $\text{Ca}(\text{OH})_2$ and $\text{Mg}(\text{OH})_2$ nanoparticles on mechanical properties of lime-treated marine clay

ABSTRACT

In this study, coir fibres were modified with nanoparticles of calcium hydroxide and magnesium hydroxide via a chemical treatment in order to increase the tensile strength of the fibres and their interaction with soil. To evaluate the modification and its effects, unconfined compressive strength tests, indirect tensile strength tests, flexural strength tests and triaxial compressive strength tests were carried out at 7, 28 and 90 days of curing age on lime-treated soil reinforced with modified and unmodified fibres. The obtained results showed that nano-modification of fibres enhanced the mechanical properties of the lime-treated clay soil due to the tensile strength of the augmented fibres. The results showed that the compressive strength, the indirect tensile strength and the flexural strength of samples treated with modified coir fibres increased by 64%, 122% and 56%, respectively compared to that of samples treated with unmodified fibres. Moreover, an increase in the effective internal friction angle and the cohesion intercept was observed. Also, the results of scanning electron microscopy and energy dispersive X-ray confirmed a desired alteration in morphology of the fibres.

Keyword: Geosynthetics; Coir fibre; Marine clay soils; Mechanical properties; Nano modification; Shear strength parameters; Soil treatment